Perspectives

PERSPECTIVES

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As a Watershed Restoration Specialist for the Vancouver Forest Region I have had the opportunity to walk hundreds of kilometres of deactivated roads in coastal British Columbia. During these outings I have inspected thousands of water control structures. Although most of the stream restorations, cross ditches, and water bars are functioning well, I have observed a number of common problems associated with these works.

The first problem is that the original prescription was not always appropriate. In other words, was the decision to locate a cross ditch at a specific location the correct one? During my field inspections I have encountered many cross ditches which contain very little or no water even after a prolonged precipitation event. A significant amount of money could have been saved if these structures were never constructed.

There are numerous publications that deal with the factors to be considered when siting a cross ditch, including one that appears to be frequently overlooked, dealing with the estimation of runoff volume (Chatwin et al 1994). Although it is difficult to be specific when quantifying runoff, the size of the drainage area up-slope of the structure is one factor that indicates the amount of potential discharge. For most upper slope or crest roads (see Figure 1) this drainage area is small. Furthermore, these roads are often located on side slopes of less than 40% and are therefore not likely to be unstable. Neither the presence of water in a ditch line, nor a small seep in the cut slope, are in themselves sufficient reasons to construct cross ditches at these locations. The prescriber should instead evaluate whether the water is causing a problem. Due to the high porosity of coastal soils, standing water in most cases will simply percolate into the groundwater system just as it would have done before the road was constructed. In areas where there are no stability concerns, a cross ditch is only appropriate if the potential runoff volume is such that it will cause excessive erosion to either the ditch line or the road surface.

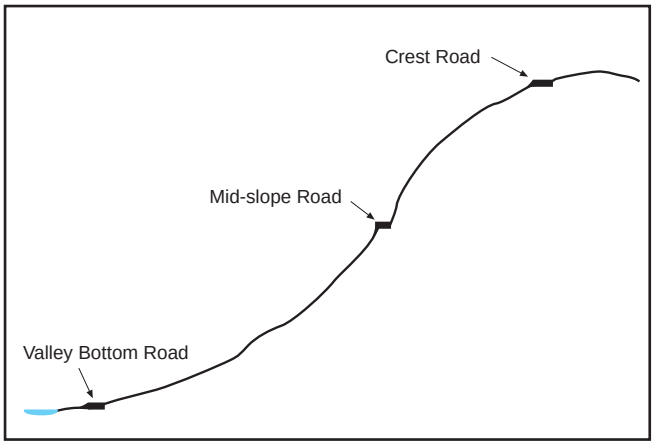

Figure 1. In most cases, the small area up-slope of the crest road will not produce a significant volume of runoff.

Another common problem with cross ditches is that water tends to pond within the cross ditch (see Figure 2) when the gradient is too shallow (i.e., the slope of the channel is insufficient between the invert at the ditchline and the outlet on the down-slope side of the road). In areas with unstable sideslopes this problem can increase the pore pressure within the soil matrix which, in turn, increases the likelihood of a mass wasting event.

Figure 2. When a cross ditch has an inward slope, as shown here, the water cannot drain from the ditch.

Most road deactivation publications suggest that a cross ditch should be out-sloped between 2 to 3% to prevent sediment from building up within the structure (Wong 1997). This recommendation applies only to roads for which vehicle access is to be maintained. For cross ditches that are to be constructed to the "no vehicle access" (i.e., T4) standard, the out-slope gradient should be greater than 3%. Unfortunately, it is almost impossible for an excavator operator to estimate slopes to within one degree (1 degree = 2.2%) and unless there is water flowing through the cross ditch at the time of construction, its gradient is easily misjudged. For roads where vehicle access is to be maintained, the gradient on a cross ditch should be maximized while still allowing for vehicle passage (i.e., a gradient of at least 5%). On roads designated for no vehicle access, the cross ditch gradient should match the natural angle of the slope.

The last problem I wish to address concerns the armouring of water control structures. Whether or not to armour a cross ditch is a decision that relates directly

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to the two issues noted above: the anticipated runoff volume and the gradient of the structure. Both these factors affect the amount of energy transferred from the moving water to the stream channel; this, in conjunction with the mass of the particles making up the substrate, determines the erosion potential.

When the road is prescribed for no vehicle access and there is no direct connection to a fish stream, cross ditches are frequently left unarmoured. Initially, this will result in an increase in the generation and export of sediment. However, after the first winter, most of the fine material will have been removed, leaving behind the coarser substrate that will "self-armour" the structure. On the other hand, if there are access or fish concerns it will likely be necessary to armour the structure (see Figure 3). This is especially true if the outlet of the water control structure empties onto an erodible fill slope.

Proper armouring of water control structures will increase the cost of the deactivation. Specifically, there will be additional excavator time required to sort and place the rock. In addition, where there is no suitable armouring material on site it will have to be developed and imported from another location. Despite this extra expense, it is preferable to do the job correctly the first time rather than to risk additional environmental damage as well as to incur the often greater costs associated with remedial work.

Figure 3. This stream restoration should have allowed for vehicle access, but the lack of adequate armouring resulted in the down-cutting of the stream channel. To regain access, a salvage crew has placed logs into the structure. Note, also, that the vehicles have scraped off the protective layer of grass on both approaches, which will further exacerbate the sediment problem.

References

Chatwin, S.C., et al (1994). *A Guide for Management of Landslide-Prone Terrain in the Pacific Northwest.*

Atkins, R.J., et al (2000) *Best Management Practices Handbook: Hillslope Restoration in British Columbia.*

Wong, R. (1997). *Advanced Road Deactivation Course Handbook.*

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Update

Conferences

2000 Coastal Forest Site Rehabilitation (CFSR) Conference, Nanaimo B.C., December 7 - 8, 2000.

The 2000 CFSR Conference is a two-day event held at Nanaimo's Port Theatre (adjacent to the Coast Bastion Inn) jointly facilitated by Malaspina University-College, Forestry Extension Program and the Forestry Continuing Studies Network (FCSN). We gratefully acknowledge the support of FRBC. This annual conference has developed a longstanding reputation for being the premier source of "leading edge" technology and information on watershed restoration. Speakers come from around the province and the Pacific Northwest to present a virtual cornucopia of issues, information and case studies. This year's program will focus on two themes, the first day will highlight presentations dealing with upslope topics and the second day will highlight presentations dealing with in-stream topics. Early Registration Fee is $105.00 + $ 7.35 gst (if applicable) if payment received on or before November 22, 2000. If you miss that date, the registration fee is $125.00 + $8.75 gst (if applicable). Fee includes: entrance to wine and cheese reception, trade show and exhibits, workshop, refreshments and lunches on Thursday and Friday, participant manual, and a souvenir item.

Restoration and Recovery: Beyond Good Intentions, Bellevue (near Seattle), Washington from April 2-6, 2001. It is planned by the Society for Ecological Restoration, Northwest Chapter. For more information check out the following web site: http://www.halcyon.com/sernw/2001conf/2001conf.htm